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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/726,386	12/01/2000	Naoto Horiguchi	001497	1274

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EXAMINER

TRAN, THIEN F

ART UNIT PAPER NUMBER

2811

DATE MAILED: 04/10/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/726,386

Applicant(s)

HORIGUCHI ET AL.

Examiner

Thien F Tran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) 4-11 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-3 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: .

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DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of claims 1-3 in Paper No. 7 is acknowledged.

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1 and 3 are rejected under 35 U.S.C. 102(b) as being anticipated by Hong (US 5,482,879).

Hong discloses the claimed semiconductor memory (Fig. 5F) comprising a semiconductor substrate 5; a tunneling insulating film 510 formed on a partial surface area of said semiconductor substrate, said tunneling insulating film inherently having a thinness enough to transmit carriers therethrough by a tunneling phenomenon; a floating gate electrode 512 formed on said tunneling insulating film; a gate insulating film (540, 542) covering a side wall of said floating gate electrode and a partial surface area of said semiconductor substrate on both sides of said floating gate electrode, said gate insulating film 542 inherently having a thickness not allowing carriers to transmit

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therethrough by the tunneling phenomenon by having the thickness greater than the thickness of the thin tunnel oxide 510; a first control gate electrode 550 disposed on said gate insulating film over the side wall of said floating gate electrode and over a partial surface area of said semiconductor substrate on both sides of said floating gate electrode; and a pair of impurity doped regions (560, 530) formed in a surface layer of said semiconductor substrate on both sides of a gate structure including said floating gate electrode and said first control gate electrode.

Regarding claim 3, Hong further discloses a dielectric film 514 formed on an upper surface of said floating gate electrode, said dielectric film inherently having a thickness not allowing carriers to transmit therethrough by the tunneling phenomenon, otherwise the memory will not function due to current leakage from the floating gate.

The claim limitations "not allowing carriers to transmit therethrough by the tunneling phenomenon" and "to transmit carriers therethrough by a tunneling phenomenon" in claim 1, and "not allowing carriers to transmit therethrough by the tunneling phenomenon" in claim 3 are functional languages and are non-limiting since it has been held that claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danley, 120 USPQ 528, 531 (CCPA 1959). "Apparatus claims cover what a device is, not what a device does." Hewlett-Packard Co. v. Bausch & Lomb Inc., 15 USPQ2d 1525, 1528 (Fed. Cir. 1990). A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex

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parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987). Furthermore, Hong has the claimed structure so it is clear that the claimed properties (functions) are inherently present in Hong's device.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hong (US 5,482,879) in view of Shigyo (US 6,222,224).

Hong as described above does not explicitly disclose materials of said floating gate electrode 512 and a channel region 520 between said pair of impurity doped regions being selected so that a Fermi level of said floating gate electrode is in a forbidden band (band gap) of the channel region when an external voltage is not applied between the channel region and said first control gate electrode. Shigyo discloses a semiconductor memory (Figs. 1A-1C) comprising a channel region 27 and a floating gate electrode 11 made of materials that provide a Fermi level at substantially the center of the band gap of the channel region (see Fig. 7 and col. 8, lines 39-50). It would have been obvious to a person having ordinary skill in the art at the time the invention was made to form the floating gate electrode 512 and the channel region 520 of materials as taught by Shigyo in order to provide a Fermi level at substantially the center of the band gap of the channel region and increase the reliability of the memory.

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Since the modified Hong provides the claimed structure having the materials that provide the Fermi level of the floating gate electrode in a forbidden band as claimed, it is inherent that a Fermi level of the floating gate electrode is obtained in a forbidden band of the channel region when an external voltage is not applied between the channel region and the first control gate electrode.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thien F Tran whose telephone number is (703) 308-4108. The examiner can normally be reached on 7:00AM - 3:30PM Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

tt
April 3, 2002



Thien Tran
Patent Examiner
Technology Center 2800